Volume 51
Number 23
November 2012

SOCIETY OF PETROLEUM ENGINEERS

SPE NEWS

COPENHAGEN SECTION

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WHY ARE WE IN THIS BUSINESS AGAIN?

Almost everything we do requires energy and it may therefore be surprising that the industries providing it are often seen as unattractive places to work.

Most people would probably be excited to meet a Google or Airbus employee and talk about technology innovation, or about their contribution to society. However, when an oil company employee has the courage to try the same thing the response may well be mixed. After all, where we see a thriving energy industry of technology, investments, opportunities and research, the general public may instead have a vision of puddles of oil, and .. of us making a mess of it. Particularly when contrasted with green energy.

A poor public image clearly is an impediment to sustainability of the Oil and Gas sector as it hinders development of staff and attraction of young people, and this is one of the things the SPE attempts to address by sharing knowledge about our industry and by raising interest among students in energy sector careers.

Locally some of these objectives are shared by another industry umbrella organisation: Oil Gas Denmark. In their mission to enhance value for the industry and society they concentrate on four pillars, one of which is Skills & Capabilities and another is Sector Development through the use of technology and innovation. I am delighted that OGD will come to the January SPE meeting and share their vision with us. Other presentations at the upcoming November and January meetings are examples of technology application and innovation: such as the DONG E&P development of a Danish field at high pressure and temperature, state-of-the-art geo-steered drilling and a Distinguished Lecturer presentation on stimulation of horizontal wells.

But let's not forget that these fine topics don't always resonate with everyone, and do not help the general public visualise the positive contributions we're making to society. Each of us, broad-minded representatives of our energy sector, can help improve the general perception of our industry in society by promoting a responsible attitude towards the environment, to safety, and to everyone's standard of living. After all, our food and shelter, our transport and manufacturing, and indeed our very survival depend on affordable energy. ALL sources of energy.

Hans Horikx,
SPE Copenhagen section chairman



Photo by Christian Carlsson

FUTURE MEETINGS

FOR MORE INFORMATION REGARDING THE PROGRAMME SEE PAGE 6

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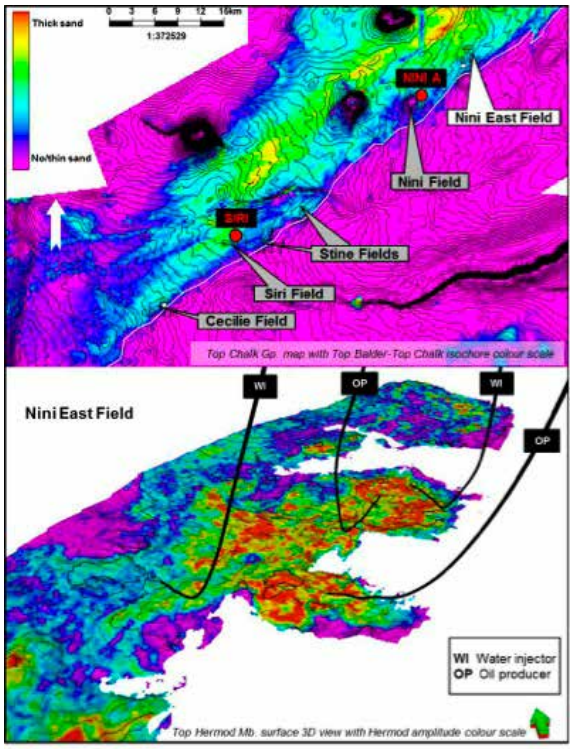
NINI EA – Not just another field

Estela Vázquez Esmerode and Keith Douglas Benton, DONG E&P

The Nini East Field

The Siri Fairway, Danish North Sea, consists of a series of sandstone units of Palaeocene–Eocene age, which were deposited as part of the infill succession of the Siri Canyon. The Siri Area, in the early days considered to be linked to a high exploration risk due to the large distance to the source rock in the Central Graben, has been shown to be rather prolific. So far, a total of ten oil discoveries have been made along the SE flank of the fairway, where lateral oil migration of up to 100 km has taken place.



The Nini East Field (NE) is the north easternmost (and shallowest) discovery in the Siri Area. A 39-km-long pipeline transports the oil produced in NE to the Siri Platform via the Nini A Platform. Prior to its production start-up in 2010, NE was considered to be comparable to the existing fields of the Siri Fairway. However, a very detailed examination of all the available data derived from drilling and production of the field proved different.

An outlier oil

Several factors make the oil found in NE differ from the general Siri Trend: slightly higher content of long-chained alkane compounds (wax fraction), higher solution methane (CH_4) and carbon dioxide (CO_2) levels, methane-rich gas caps with different gas-oil-contacts and scattered siderite cementation around the oil-water-contact (OWC).

Not just a "copy-paste" history

Laboratory testing of the NE reservoir fluids identified the long chained alkane compounds (i.e. wax fraction) that promote the classification of the NE crude as being 'waxy'. Wax content generally decreases with increasing maturity, as the long alkane chains are cracked down to lower molecular components. The NE oil shows therefore the lowest maturity of all the Siri Area oils.

The reservoir depth ranges between 1650 and 1665 m TVDSS and the average temperature is ca. 55°C. Oil biodegradation is known to be a critical factor to take into account at low-temperature reservoirs. Some of the by-products of biodegradation are anomalously high CH_4 and CO_2 levels, both in solution and in the form of gas caps. Additionally CO_2 reduction results in the formation of secondary biogenic methane. This concurs with the observations from NE. Analyses conducted on oil samples at different levels throughout the oil zone reveal that the oil close to the OWC is biodegraded, as opposed to the oil higher in the hydrocarbon column.

ST in the Siri Area

The Eocene reservoir of NE is a glauconite-rich poorly consolidated sandstone, with very high porosity (total porosity 35–38%) and permeability (400–2.500 mD), due to the very limited mechanical compaction and chemical diagenesis. However, around the OWC, scattered siderite cementation (4–8 vol%) is observed. Isotopic fingerprinting of these iron carbonates reveals that they were formed as a by-product of bacterial oxidation of hydrocarbons.

All observations from NE show that, in this geological setting and following the field's burial history, significant oil biodegradation has taken place, giving rise to the generation of local methane-rich gas caps, enrichment of dissolved CO_2, and biodegraded oil and scattered carbonate cementation at the OWC.



Carbon dioxide (CO_2)

The impact from the high level of CO_2 in the production stream was that the Chrome (Cr) content in the NE production tubing was increased to 13%. This design change, in combination with the continuous injection of corrosion inhibitors, is intended to improve the resistance against CO_2-induced weight-loss corrosion that can cause pitting or holes in the production tubing.

Consideration was also given to the other wells in the Siri Area because the NE produced gas is processed with the gas from the rest of the fields. The impact from comingling the gas is that the lift gas feeding all the Siri Area wells has a higher CO_2 content; this was not part of the design criteria when specifying the metallurgy for the wells completed prior to NE coming online. Hence, to mitigate the risk of corrosion occurring in the wells with the lower Cr production tubing, the gas lift stream is continuously 'spiked' with corrosion inhibitors.

Methane (CH_4)

The effect from the increased level of CH_4 coming from NE, was realized at the compressor on the Siri Platform. The introduction of the 'lighter' gas (i.e. more CH_4) into the Siri process lowered the average molecular gas weight in the production system. This subsequently forced the centrifugal compressor to operate outside its designed operating envelope. To mitigate the risk of a catastrophic compressor failure, the decision was made to 're-wheel' the compressor in 2011, hence safeguarding against a very expensive compressor repair and minimise the production deferment from the Siri area.

Wax management

The enhanced wax fraction of the NE oil, when combined with the low NE reservoir temperature, makes it challenging to avoid the precipitation and deposition of wax in the production system. Knowing the wax appearance temperature (WAT) is crucial to minimise the risk of creating the right temperature and pressure conditions for the wax components to drop out of solution. NE defies normal petroleum industry logic because an increase in water production would actually be valued due to the high heat capacity of the water. However, the baffle at the OWC generated by the siderite cementation has resulted in a delay of the water breakthrough. This has had a negative impact on the temperature management, but a positive impact on oil production.

In terms of the pipeline strategy, when NE is online, every effort is made to ensure the colder NE fluids are combined with a high water cut well from the Nini Field, in order to keep the production stream temperature above the WAT. This action is deemed essential during NE's early field life due to the field's delayed water production. In conjunction with managing the temperature of the produced fluids, a routine pipeline pigging plan and a wax inhibitor plan form the basis of DONG E&P's strategy towards 'Wax Management' and the subsequent optimisation of the NE wells.

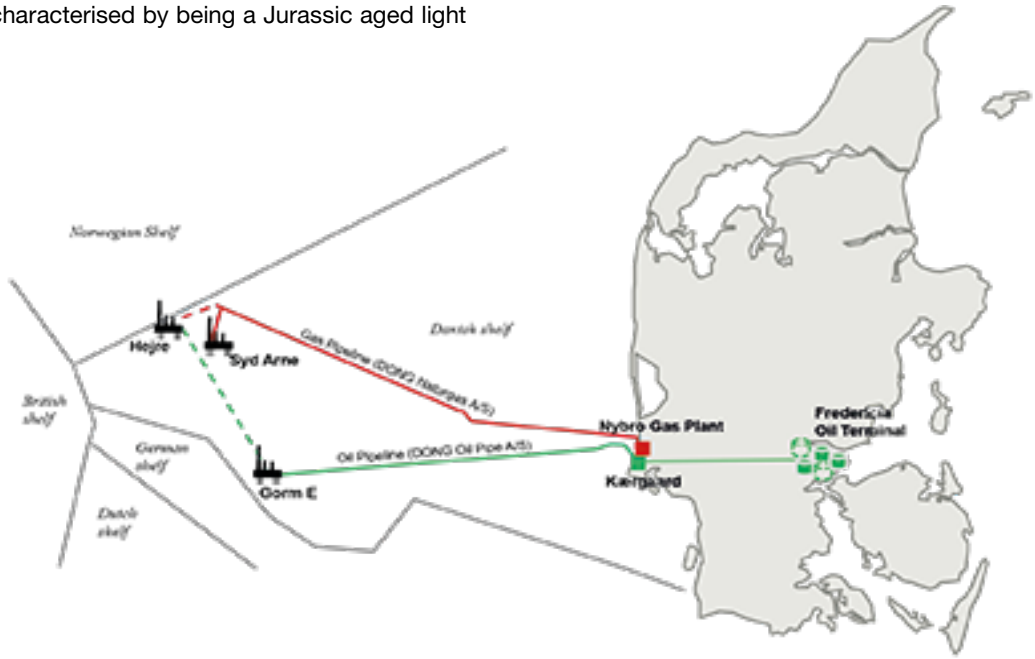
Summary

The microbial activity in the NE reservoir has had a severe impact on the rest of the Siri Area. The production of light gas (CH_4) has challenged the facilities (i.e. the compressors), the high CO_2 content has merited a design change with respect to tubing metallurgy and the addition of NE's 'waxy' crude has posed some challenges with regards wax precipitation in the production system. The cementation at the OWC has resulted in a delayed water breakthrough. This has not aided in maintaining the temperature of the fluids in the production system above the WAT. However, the impact of the biodegradation should not be considered all bad. The high efficiency of the baffle generated by cementation at the OWC has yielded an improvement of the field Recovery Factor indicated by the first dynamic models. Understanding the fluid composition and the biodegradation history of the NE field has proven to be of crucial importance. ◄

ABSTRACT

Denmark's first HPHT Development: HEJRE

DONG E&P A/S (60%) as the Operator and license Partners Bayerngas Norway (40%) sanctioned in early 2012 Denmark's first HPHT development, Hejre, located in the northern part of the DCS and the development project is now underway preparing for construction activities and subsurface development activities. Hejre is characterised by being a Jurassic aged light oil sand discovery buried more than 5 kilometres deep at pressures and temperatures exceeding 1,000 bars and 160 Deg. Celsius, respectively. The presentation will provide an overview of the chosen development concept, strategy and challenges ahead during project execution and beyond in production mode. ◄



BIOGRAPHY



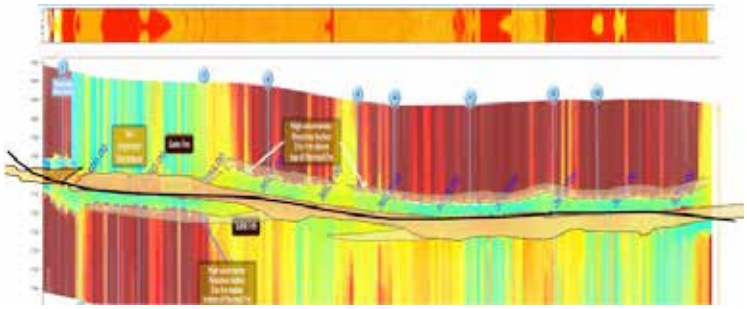
Søren Reinhold Poulsen, DONG E&P

Søren Reinhold Poulsen re-joined DONG E&P in 2012 as Hejre Asset Manager. He has a background in Reservoir Engineering and holds 15 years of industry experience gained from positions within subsurface and asset management in various E&P companies. He has been engaged in green- and brownfield developments as well as reservoir management of producing assets located in the North Sea. Søren earned his MSc degree in Chemical Engineering at the Technical University of Denmark flavoured with an integrated 1-year petroleum study module at the Technical University of Norway in Trondheim. ◄

ABSTRACT

Geosteering in thin injected sands by optimised operational setup and state-of-the-art LWD - NINI EAST FIELD

Since the first development wells were drilled in the Paleogene fields of the Siri Fairway focus has moved towards the more marginal fields or field segments where the placement of the wells within the reservoir becomes more and more challenging. This has led to the development of operational and organisational practices that together with use of "state of the art" drilling tools have allowed successful drilling and completion of very challenging wells. ◄

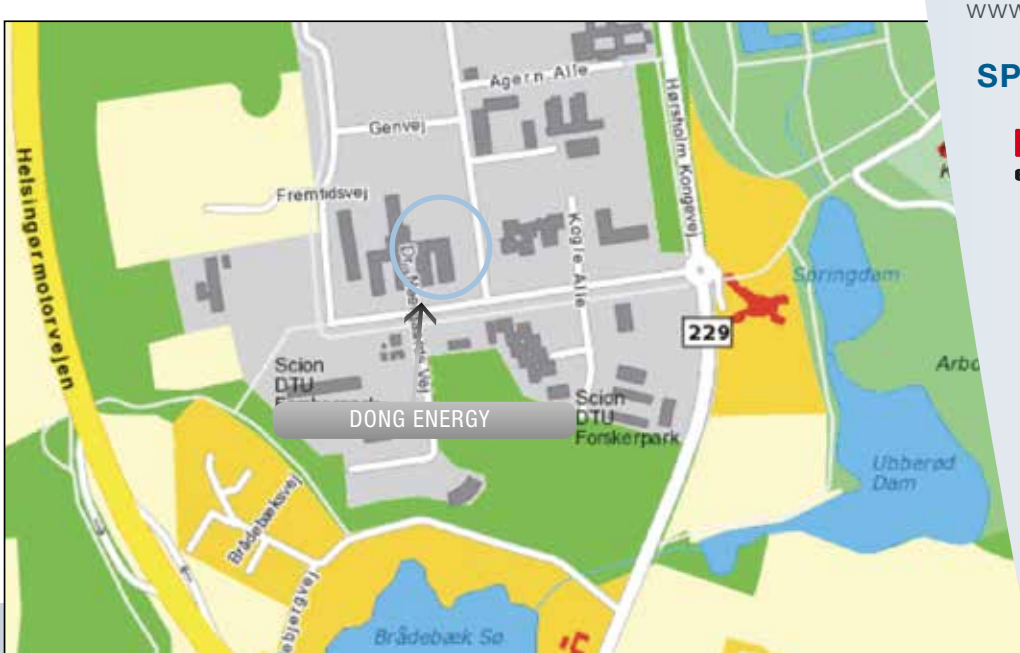


BIOGRAPHY



Thomas Stærmose, DONG E&P

Thomas Stærmose graduated in 1990 with a MSc. In Geology from University of Copenhagen. He has worked with oil industry related topics for more than 30 years if one includes student positions held in the Geophysical department of the Danish Geological Survey (Now GEUS). Thomas has been working with Dong E&P for close to fifteen years with the main focus on exploration and development. The main focus of his current position as Subsurface Operations Manager is the work associated with planning and drilling of development wells within the fields of the Siri Fairway. ◄



COPENHAGEN
MEETING
WEDNESDAY 21 NOVEMBER

NOVEMBER

PROGRAMME
17:00 - 18:00
Drinks

18:00 - 19:00
Presentation and SPE News

19:00 - 21:00
Dinner

LOCATION
DONG Energy
Agern Allé 24-26
2970 Hørsholm

SPEAKERS
Søren Poulsen
DONG E&P

TOPIC
Denmark's first HPHT development: Hejre

DINNER SPEAKER
Thomas Stærmose
DONG E&P

TOPIC
Geosteering in thin injected sands by optimised operational setup and state-of-the-art LWD - Nini East Field

ENTRANCE FEE
None

REGISTRATION
Please indicate your attendance by Friday 16 November by signing up on the internet www.spe-cph.dk

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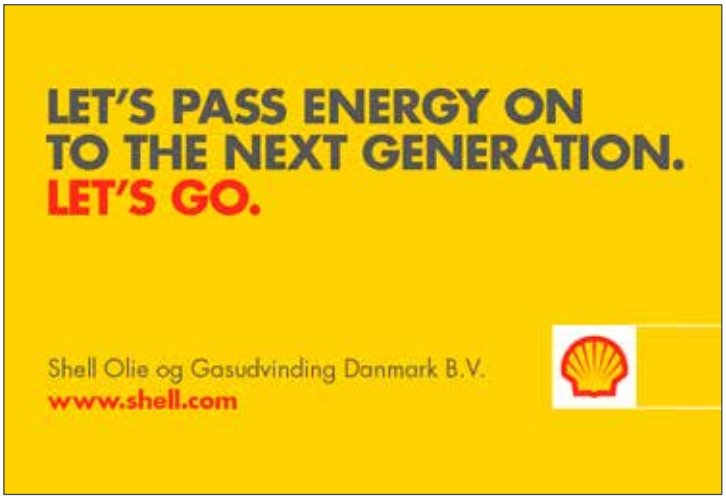
SPE MEETING SCHEDULE 2012-2013

September 11	MAIN SPEAKER	AFTER DINNER
TOPIC	**Putting The Energy Industry In Perspective**	Safety Management – learnt the hard way Odd Sevland
SPEAKER	Phil Rae - SPE DL, (InTuition Energy Associates Ltd)	
LOCATION	Shell Mikado House	
SPONSOR	SHELL	
October 24	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**DTU Research**	Overview of the large projects at CERE – Center for Energy Resources Engineering, DTU Alexander Shapiro
SPEAKER	DTU Ph.D Candidates: Alsu Khusainova, Esther Rosenbrand and Andrea Capolei	
LOCATION	DTU, Building 101 B auditorium 1	
SPONSOR	DTU	
November 21	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Denmark's first HPHT development: Hejre**	Geosteering in thin injected sands by optimised operational setup and state-of-the-art LWD - Nini East Field Thomas Stærmose, DONG E&P
SPEAKER	Søren Poulsen, DONG E&P	
LOCATION	DONG	
SPONSOR	DONG	
January 14	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Hydraulic Fracturing of Horizontal Wells – Realizing the Paradigm Shift that has been 30 Years in Development**	Oil Gas Denmark Martin Naesby (Oil Gas Denmark)
SPEAKER	C. Maarson - SPE DL, (Liberty Resources LLC)	
LOCATION	Moltkes Palæ	
SPONSOR	Hess	
February 5	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Farsund Formation Tight Reservoirs**	Johan Sverdrup Anthony Purpich, Maersk Oi
SPEAKER	Nijs Nederveen, Maersk Oil	
LOCATION	Maersk	
SPONSOR	Maersk	
March 7	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**What Do We Have to Do to a Drilling Fluid to Maximise Well Productivity ?**	
SPEAKER	Stephen Vickers - SPE DL, (Baker Hughes)	
LOCATION		
SPONSOR	Chevron	
April	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**A novel, annular barrier for improved zonal isolation and cement assurance**	
SPEAKER	Lambert Dilling, Welltec	
LOCATION	Welltec	
SPONSOR	Welltec	
May	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**Source Rock Potential in Denmark**	Annual General Meeting
SPEAKER	Henrik I. Petersen, GEUS	
LOCATION	GEUS	
SPONSOR	GEUS	
June	**MAIN SPEAKER**	**AFTER DINNER**
TOPIC	**SPE Summerparty**	
SPEAKER		
LOCATION		
SPONSOR	Schlumberger	

If you attended Phil Rae's talk at the last SPE meeting, please take the time to fill in the online evaluation at:

www.spe.org/dl/contest.php













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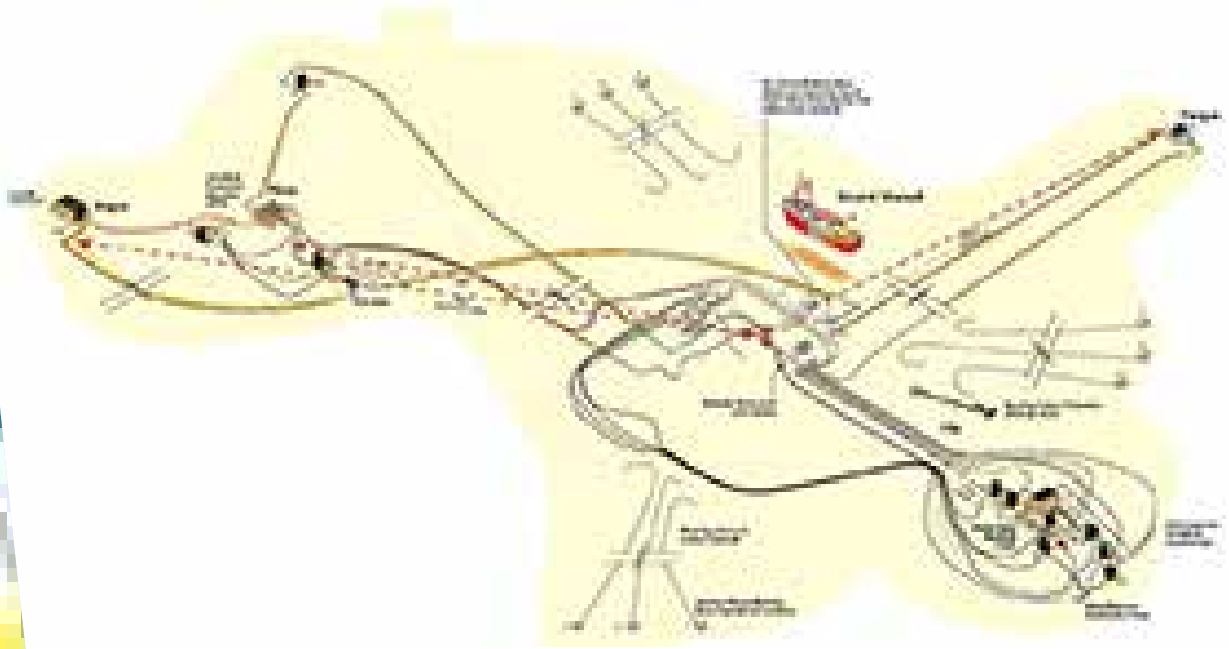
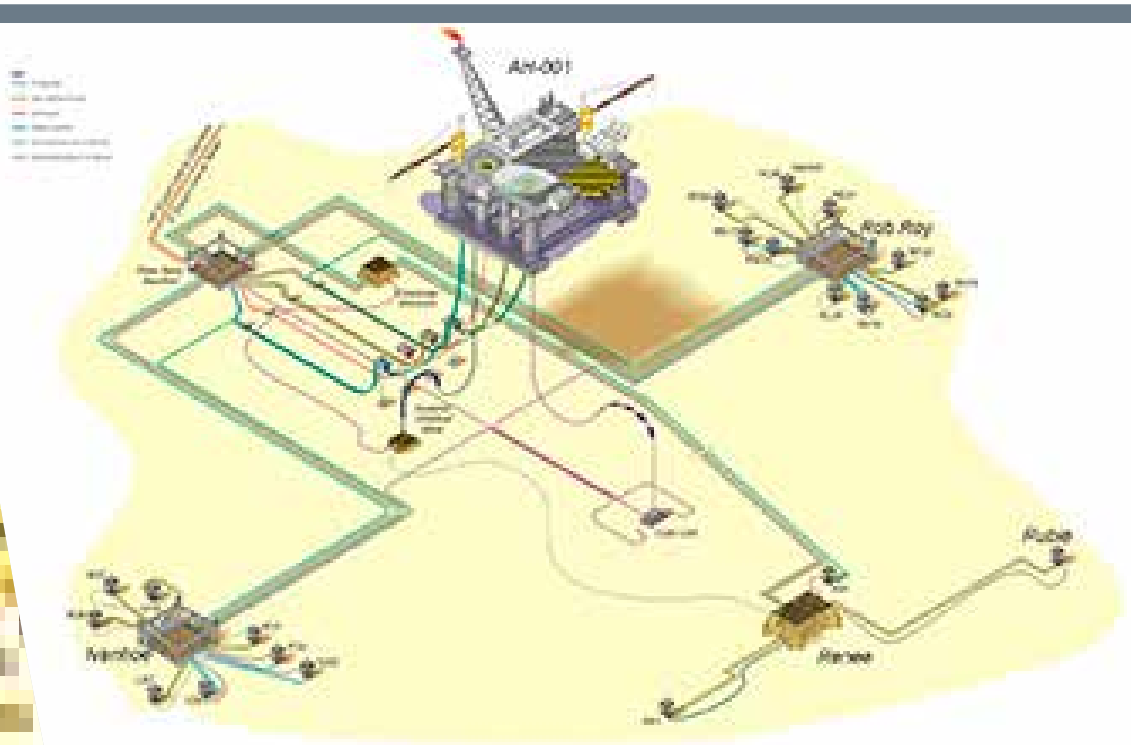
Undertakes Challenging **North Sea** Decommissioning Projects





In the Union Plaza office in the heart of Aberdeen, a specialist Hess E&P team is facing some big challenges as it works to complete one of the largest subsea decommissioning projects in the North Sea.

It has now been four years since the Fife, Fergus, Flora and Angus fields (FFFA) stopped production after delivering more than 100 million barrels. Significant planning and research was undertaken to map out a safe and effective decommissioning programme, which was approved by the UK authorities in March 2012. The programme is significant, and involves the recovery of more than 7,000 tonnes of steel and concrete, 95 per cent of which will be recycled.

Although the team recognise that decommissioning is often regarded as the 'uncool' part of the E&P business, they stress that every day they face new challenges and handle cutting edge technologies in the North Sea's harsh marine environment.

"I have spent 31 years in the E&P business, but this is a fresh challenge because you come across issues you very seldom come across in your career," says Martyn Ferguson, Hess' drilling manager "When you do a workover on a producing well, you are trying to repair something which is broken or enhance the value of what is already there, whereas now you are trying to deconstruct it in a cost-effective manner so it holds up in perpetuity."

Richard Jameson, decommissioning manager, adds, "As with any project, we have to be constantly aware of all the potential outcomes. And because decommissioning on this scale is rare, we have to be even more conscious of this than normal. Instead of just having a single 'A' plan, we have to think of 'B', 'C' and 'D' plans. We fully expect to develop and share new technologies during the life of this project."

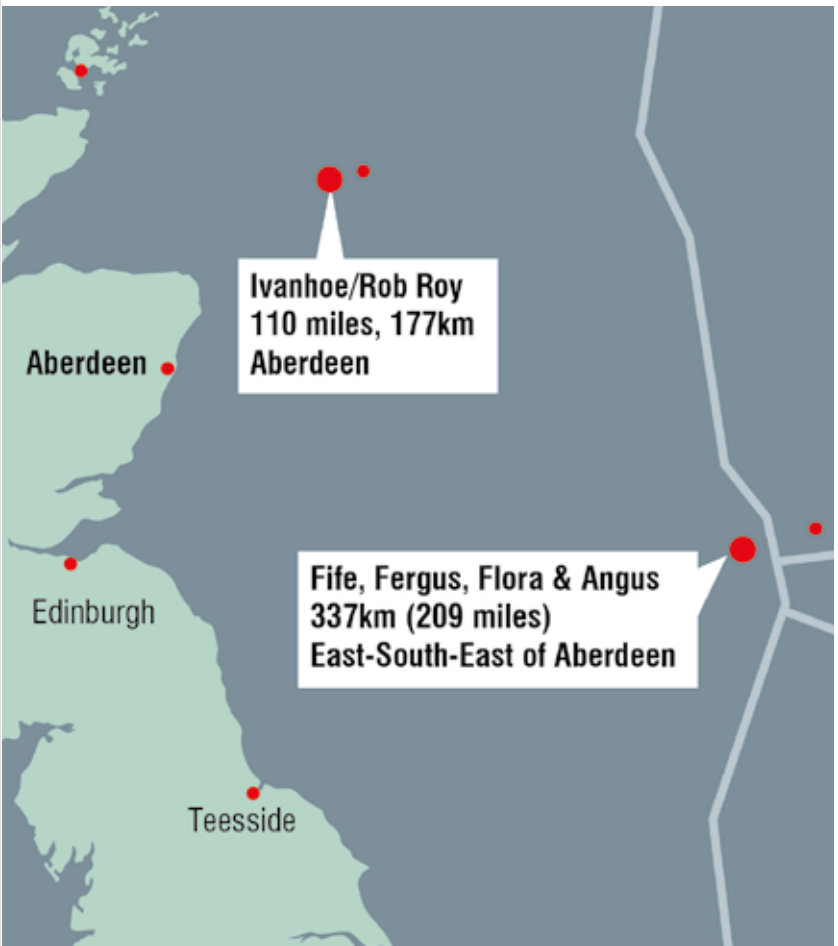
While many wells have already been abandoned in the North Sea, these have primarily been from fixed platforms which don't present the difficulties of movement and hostile weather that have been encountered by the team.

"These wells are all on the seabed and not accessible other than by remote operations from a light well intervention vessel or a floating semi," explains Ferguson.

"That is what makes the intervention so much more complicated because your tree and all the controls for that tree are on the seabed. You can't just wander down to the wellhead bay and turn a valve. It is more involved and there is more potential for unexpected outcomes."

"It becomes a lot more intervention-intensive and it is not as easy as most people who have never done it would have you believe."

Hess is due to start its second significant decommissioning project in the region next year. The Ivanhoe Rob Roy decommissioning program involves removing the three manifolds on the seabed – the production manifolds, which weigh 359 tonnes and 452 tonnes respectively, and the riser base manifold. Already, the team emphasize, their experience means that they should be more efficient whilst meeting Hess's high standards. ◄





ABSTRACT

Hydraulic Fracturing of Horizontal Wells—Realizing the Paradigm Shift That Has Been 30 Years in Development

Horizontal drilling as a field development technique was pioneered in the early 1980s. This presentation is divided into three sections—a review of horizontal well stimulation technology development, a discussion of the two main types of multistage completion technologies being employed together with the application of cross-linked and slickwater fracturing, and a review of current applications and results. ◄

BIOGRAPHY



C. Mark Pearson, President of Liberty Resources

C. Mark Pearson is president of Liberty Resources, a Denver-based independent E&P company. He is the former President and CEO of CARBO Ceramics Inc. (NYSE: CRR), the world's largest producer of ceramic proppant for use in the hydraulic fracturing of oil and natural gas wells.

Dr. Pearson is a twelve-year veteran of Atlantic Richfield Company (ARCO) where his responsibilities included leading the company's production enhancement technology group, and leading implementation of horizontal well completions and fracturing at the Kuparuk River Field, Alaska. He is an SPE distinguished member who has more than 30 years of SPE DISTINGUISHED LECTURER PROGRAM 2012–13 experience in the exploration and production (E&P) and service industries. ◄



ABSTRACT

OIL GAS DENMARK

Oil Gas Denmark (OGD) was launched on 23 August 2012. OGD represents oil and gas companies and the supplier and service industry in Denmark. OGD has been established as an umbrella organization and is founded on Danish Operators and Danish Offshore Industry. The main focus for the organization is to increase value for the companies as well as for society.

The Danish oil and gas industry is facing major challenges in the years to come. There is still a significant volume of oil and gas left in the Danish part of the North Sea, but the fields are mature and relatively small in comparison with eg. Norway or UK. This calls for massive investments in research and improved technology, exploration, field development and life extension of existing fields if the value is to be increased.

If we are to succeed, we need a coordinated effort in order to further develop the sector in the areas of technology enhancement, education, safety and environment. OGD offers a joint forum to promote this task. OGD will create more openness about the sector and increase the understanding of the potential and challenges which we are facing. ◄

BIOGRAPHY



Martin Peter Næsby, Oil Gas Denmark

Martin Peter Næsby (51) is Managing Director of Oil Gas Denmark, the newly formed trade organization for the Danish upstream oil and gas sector.

Working 15 years in several managerial positions with Maersk Oil, Martin has a wide-ranging 'hands-on' oil and gas experience. He has been posted in Kazakhstan as Deputy Managing Director and is former Head of Legal Department in Denmark. He was posted for five years in Qatar, where he held a position as Head of Legal and Corporate Affairs as a member of the management team that implemented the USD 6 billion Al Shaheen 2005 Field Development Plan. Most recently he was Project Manager for the Qatar Long Term Commitment Team at Maersk Oil, Corporate Technology and Projects Dept.

Martin has joined several management training programs at among other IMD, Switzerland. He has a law degree from University of Copenhagen and has studied law in Bonn, Germany. Before entering the oil and gas sector he worked for a number of years with the law firm Bech-Bruun, Copenhagen specializing in reconstruction. ◄

COPENHAGEN
MEETING
MONDAY 14 JANUARY

JANUARY

PROGRAMME
17:00 - 18:00
Drinks

18:00 - 19:00
Presentation and SPE News

19:00 - 21:00
Dinner

LOCATION
Moltkes Palæ
Dronningens Tværgade 2 A
1302 København K

SPEAKERS
C. Mark Pearson, SPE DL

TOPIC
Hydraulic fracturing of horizontal wells - realizing the paradigm shift that has been 30 years in development

DINNER SPEAKER
Martin Naesby
Oil Gas Denmark

TOPIC
Oil Gas Denmark

ENTRANCE FEE
None

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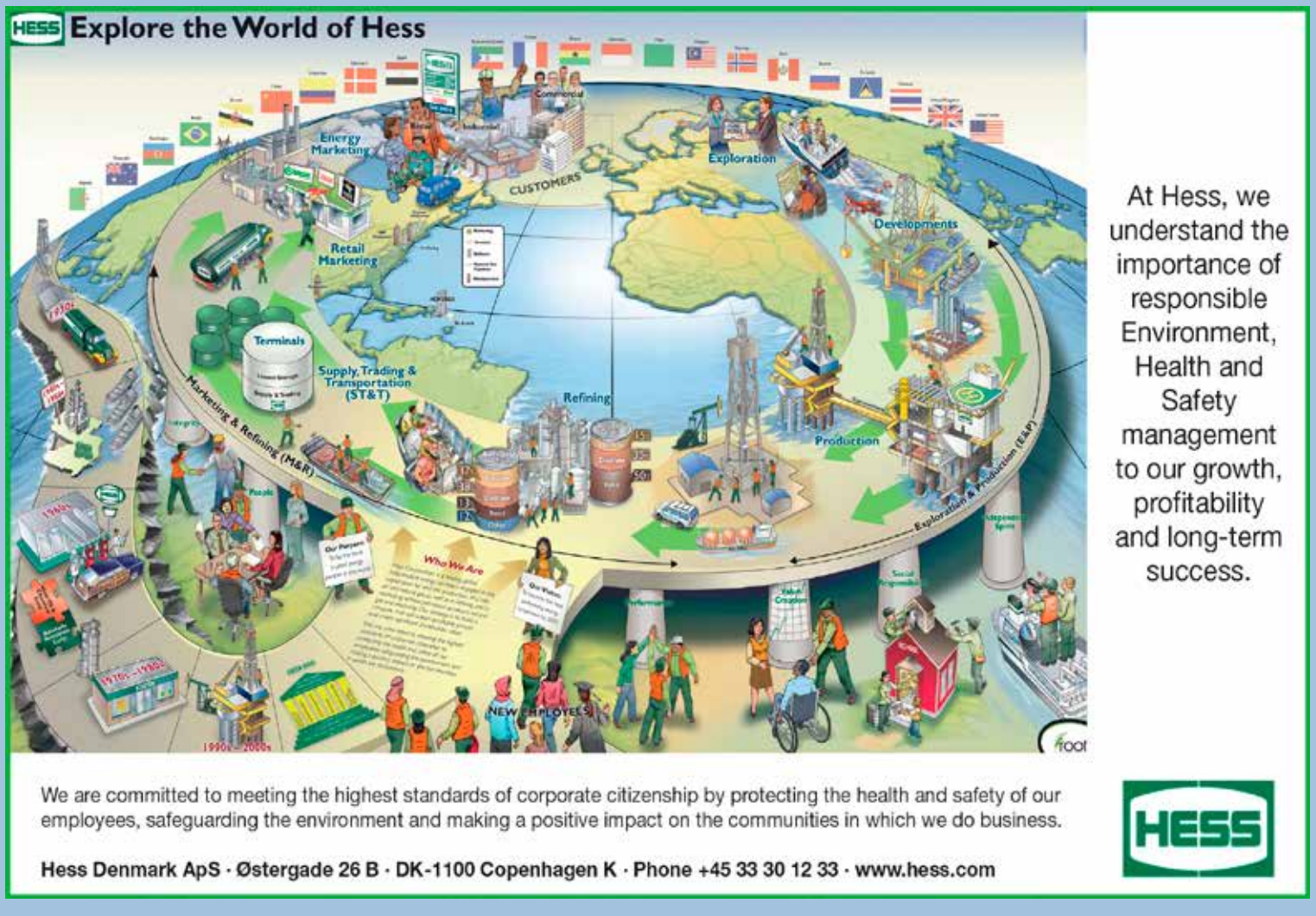
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